

WHAT IS CLAIMED IS:

1. A method for enhancing the mobilization of multilineage hematopoietic stem cells to peripheral blood, comprising the step of administering to a subject in need thereof, an effective amount of an oligopeptide having the amino acid sequence of any one of Tyr-Gly-Phe-Gly-Gly, Tyr-Gly-Phe-His-Gly, Gly-Phe-Gly-Gly and Met-Tyr-Gly-Phe-Gly-Gly as denoted by SEQ ID NOs:1, 2, 3 and 4 respectively, or of a pharmaceutical composition comprising the same.
2. The method according to claim 1, wherein said stem cells are multilineage early CD34 positive stem cells.
3. The method according to claim 1, wherein said circulating multilineage stem cells are double positive CD34/Flk2 cells.
4. The method according to claim 1, wherein said oligopeptide is a pentapeptide having the formula: Tyr-Gly-Phe-Gly-Gly, as denoted by the amino acid sequence of SEQ ID NO:1.
5. The method according to claim 1, wherein said oligopeptide is a pentapeptide having the formula: Tyr-Gly-Phe-His-Gly, as denoted by the amino acid sequence of SEQ ID NO:2.
6. The method according to claim 1, wherein said oligopeptide is a tetrapeptide having the formula: Gly-Phe-Gly-Gly, as denoted by the amino acid sequence of SEQ ID NO:3.

7. The method according to claim 1, wherein said oligopeptide is a hexapeptide having the formula: Ac-Met-Tyr-Gly-Phe-Gly-Gly, as denoted by the amino acid sequence of SEQ ID NO:4.
8. A method for enhancement of the number of circulating multilineage early CD34 positive stem cells, comprising the step of administering to a subject in need thereof, an effective amount of an oligopeptide having the amino acid sequence of any one of Tyr-Gly-Phe-Gly-Gly, Tyr-Gly-Phe-His-Gly, Gly-Phe-Gly-Gly and Met-Tyr-Gly-Phe-Gly-Gly as denoted by SEQ ID NOs:1, 2, 3 and 4 respectively, or of a pharmaceutical composition comprising the same.
9. The method according to claim 8, wherein said subject in need thereof is a patient receiving irradiation or chemotherapy.
10. The method according to claim 8, wherein said subject suffers from any one of hematological disorders, solid tumors, immunological disorders and aplastic anemia.
11. The method according to claim 10, wherein said hematological disorder is selected from the group consisting of lymphomas, leukemias, Hodgkin's diseases and myeloproliferative disorders.
12. The method according to claim 8, wherein said circulating multilineage stem cells are double positive CD34/Flk2 cells.
13. A method for enhancing the selective proliferation of CD34 positive hematopoietic stem cells in a subject in need thereof, comprising the step of administering to a subject in need thereof, an effective amount of an oligopeptide having the amino acid sequence of any one of Tyr-Gly-Phe-Gly-

Gly, Tyr-Gly-Phe-His-Gly, Gly-Phe-Gly-Gly and Met-Tyr-Gly-Phe-Gly-Gly as denoted by SEQ ID NOs:1, 2, 3 and 4 respectively, or of a pharmaceutical composition comprising the same.

14. The use according to claim 13, wherein said CD34 positive cells are double positive CD34/Flk2 cells.
15. A method for selectively increasing the number of any one of the BFU-E and GEMM colony forming units (CFU), comprising the step of administering to a subject in need thereof, an effective amount of an oligopeptide having the amino acid sequence of any one of Tyr-Gly-Phe-Gly-Gly, Tyr-Gly-Phe-His-Gly, Gly-Phe-Gly-Gly and Met-Tyr-Gly-Phe-Gly-Gly as denoted by SEQ ID NOs:1, 2, 3 and 4 respectively, or of a pharmaceutical composition comprising the same.
16. The method according to claim 13, wherein said subject in need thereof is a patient receiving irradiation or chemotherapy.
17. The method according to claim 16, wherein said subject suffers from any one of hematological disorders, solid tumors, immunological disorders and aplastic anemia.
18. The method according to claim 17, wherein said hematological disorder is selected from the group consisting of lymphomas, leukemias, Hodgkin's diseases and myeloproliferative disorders.
19. A method for enhancing the number of any one of the BFU-E and GEMM colony forming units (CFU) comprising exposing said cells to an effective amount of an oligopeptide comprising the amino acid sequence Tyr-Gly-Phe-Gly-Gly, Tyr-Gly-Phe-His-Gly, Gly-Phe-Gly-Gly and Met-Tyr-Gly-

Phe-Gly-Gly as denoted by SEQ ID NOs:1, 2, 3 and 4 respectively, or of a composition comprising said oligopeptide as an effective ingredient.

20. A method of treating a subject suffering from any one of hematological disorders, solid tumors, immunological disorders and aplastic anemia, comprising administering to said subject a therapeutically effective amount of an oligopeptide having stimulatory activity on hematopoietic cells and comprising the amino acid sequence Tyr-Gly-Phe-Gly-Gly, Tyr-Gly-Phe-His-Gly, Gly-Phe-Gly-Gly and Met-Tyr-Gly-Phe-Gly-Gly as denoted by SEQ ID NOs:1, 2, 3 and 4 respectively, or of a composition comprising said oligopeptide as an effective ingredient.
21. A method of treating a subject suffering from any one of hematological disorders, solid tumors, immunological disorders and aplastic anemia, comprising administering to said subject a therapeutically effective amount of an oligopeptide having stimulatory activity on hematopoietic cells and comprising the amino acid sequence Tyr-Gly-Phe-Gly-Gly, Tyr-Gly-Phe-His-Gly, Gly-Phe-Gly-Gly and Met-Tyr-Gly-Phe-Gly-Gly as denoted by SEQ ID NOs:1, 2, 3 and 4 respectively, or of a composition comprising said oligopeptide as an effective ingredient, in support of the treatment of the subject by bone marrow transplantation.
22. The method according to claim 20, wherein said hematological disorder is any one of a lymphoma, leukemia, Hodgkin's disease and myeloproliferative disorder.
23. A method of treating a subject suffering from a myeloproliferative disorder, comprising administering to said subject a therapeutically effective amount of an oligopeptide having the amino acid sequence of any one of Tyr-Gly-Phe-Gly-Gly, Tyr-Gly-Phe-His-Gly, Gly-Phe-Gly-Gly and Met-Tyr-Gly-

Phe-Gly-Gly as denoted by SEQ ID NOs:1, 2, 3 and 4 respectively or of a composition comprising said oligopeptide as an effective ingredient.

24. The method according to claim 23, wherein said myeloproliferative disorder is idiopathic myelofibrosis (IMF).
25. A method for enhancing the proliferation of hematopoietic stem cells comprising exposing said cells to an effective amount of an oligopeptide having stimulatory activity on production of hematopoietic cells and comprising the amino acid sequence Tyr-Gly-Phe-Gly-Gly, Tyr-Gly-Phe-His-Gly, Gly-Phe-Gly-Gly and Met-Tyr-Gly-Phe-Gly-Gly as denoted by SEQ ID NOs:1, 2, 3 and 4 respectively, or of a composition comprising said oligopeptide as an effective ingredient.
26. A method for enhancing the proliferation of hematopoietic CD34 positive cell stem cells comprising exposing said cells to an effective amount of an oligopeptide having the amino acid sequence of any one of Tyr-Gly-Phe-Gly-Gly, Tyr-Gly-Phe-His-Gly, Gly-Phe-Gly-Gly and Met-Tyr-Gly-Phe-Gly-Gly as denoted by SEQ ID NOs:1, 2, 3 and 4 respectively, or of a composition comprising said oligopeptide as an effective ingredient.
27. The method according to claim 26, wherein said CD34 positive cell is a Flk2 positive cell.
28. A method for the preparation of a peripheral blood stem cell transplant for the treatment of a subject in need thereof comprising the step of administering to a donor an effective amount of an oligopeptide having the amino acid sequence of any one of Tyr-Gly-Phe-Gly-Gly, Tyr-Gly-Phe-His-Gly, Gly-Phe-Gly-Gly and Met-Tyr-Gly-Phe-Gly-Gly as denoted by SEQ ID NOs:1, 2, 3 and 4 respectively, or of a composition comprising said

oligopeptide as an effective ingredient, thereby enhancing the mobilization of hematopoietic stem cell to the peripheral blood of said donor and obtaining from said donor a sufficient amount of peripheral blood stem cells.

29. A method for enhancement of engraftment of bone marrow transplants, hemopoietic reconstruction, bone marrow re-population and number of circulating stem cells, which method comprises the step of administering to any one of a cell or of a subject in need thereof, an effective amount of an oligopeptide having stimulatory activity on hematopoietic cells and having the amino acid sequence of any one of Tyr-Gly-Phe-Gly-Gly, Tyr-Gly-Phe-His-Gly, Gly-Phe-Gly-Gly and Met-Tyr-Gly-Phe-Gly-Gly as denoted by SEQ ID NOs:1, 2, 3 and 4 respectively, or of a composition comprising said oligopeptide as an effective ingredient.

30. A method for enhancement of engraftment of bone marrow transplants, hemopoietic reconstruction, bone marrow re-population and number of circulating stem cells in patients receiving chemotherapy or irradiation, which method comprises the step of administering to any one of a cell or of a subject in need thereof, an effective amount of an oligopeptide having stimulatory activity on hematopoietic cells and having the amino acid sequence of any one of Tyr-Gly-Phe-Gly-Gly, Tyr-Gly-Phe-His-Gly, Gly-Phe-Gly-Gly and Met-Tyr-Gly-Phe-Gly-Gly as denoted by SEQ ID NOs:1, 2, 3 and 4 respectively, or of a composition comprising said oligopeptide as an effective ingredient.

31. A method according to claim 29, wherein said oligopeptide increases the number of circulating multilineage stem cells.

32. The method according to claim 31, wherein said multilineage stem cells are the circulating early precursor CD34 positive cells.

33. The method according to claim 32, wherein said multilineage stem cells are the circulating early precursor double positive CD34/Flk2 cells.
34. The method according to claim 29, wherein said oligopeptide enhances the immature cell and monocyte recovery.
35. The method according to claim 29, wherein said oligopeptide selectively increases any one of the BFU-E and GEMM colony forming units (CFU).
36. The method according to claim 29, for supporting bone marrow transplantation by increasing proliferation of stem cells, accelerating the hematological reconstruction upon bone marrow transplantation and increasing the cellularity of bone marrow.
37. A method for reducing acute transplant rejection in a transplanted patient, comprising administering to said patient an effective amount of an oligopeptide having stimulatory activity on hematopoietic cells and comprising the amino acid sequence Tyr-Gly-Phe-Gly-Gly, Tyr-Gly-Phe-His-Gly, Gly-Phe-Gly-Gly and Met-Tyr-Gly-Phe-Gly-Gly as denoted by SEQ ID NOs:1, 2, 3 and 4 respectively, or of a composition comprising said oligopeptide as an effective ingredient.
38. A method for *in vitro* and/or *ex vivo* maintaining and/or expanding stem cell population in a blood sample comprising isolating peripheral blood cells from said blood sample, enriching blood progenitor cells expressing the CD34 antigen, cluttring the enriched blood progenitor cells under suitable conditions, treating said cells with an oligopeptide having the amino acid sequence of any one of Tyr-Gly-Phe-Gly-Gly, Tyr-Gly-Phe-His-Gly, Gly-Phe-

Gly-Gly and Met-Tyr-Gly-Phe-Gly-Gly as denoted by SEQ ID NOs:1, 2, 3 and 4 respectively or with a composition comprising said oligopeptide as an effective ingredient.

39. The method according to claim 38, wherein said cells are in cell culture.
40. The method according to claim 38, wherein said blood sample is mammalian blood sample.
41. The method according to claim 40, wherein said blood sample is a human blood sample.
42. The method according to claim 40, wherein said blood sample originates from a mammal suffering from, or susceptible to decreased blood cell counts.
43. The method according to claim 42, wherein said decreased blood counts are caused by chemotherapy, irradiation therapy, or bone marrow transplantation therapy.
44. The method according to claim 43, wherein said composition further comprises at least one cytokine.
45. The method according to claim 44, wherein said cytokine is selected from the group consisting of TPO (Thrombopoietin), EPO (Erythropoietin), M-CSF (Macrophage-colony stimulating factor), GM-CSF (Granulocyte-macrophage-CSF), G-CSF (Granulocyte CSF), IL-1 (Interleukin-1), IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-12, LIF (Leukemia inhibitory factor) and KL (Kit ligand).

46. A method for re-populating blood cells in a mammal comprising administering to said mammal a therapeutically effective amount of an oligopeptide having stimulatory activity on hematopoietic cells and having the amino acid sequence of any one of Tyr-Gly-Phe-Gly-Gly, Tyr-Gly-Phe-His-Gly, Gly-Phe-Gly-Gly and Met-Tyr-Gly-Phe-Gly-Gly as denoted by SEQ ID NOs:1, 2, 3 and 4 respectively, or of a composition comprising said oligopeptide as an effective ingredient.
47. The method of claim 46, wherein said blood cell is any one of erythroid, myeloid and lymphoid cells.
48. A method for increasing the number of white blood cells, circulating hematopoietic stem cells, and overall bone marrow cellularity comprising administering to a subject a therapeutically effective amount of an oligopeptide having stimulatory activity on hematopoietic cells and having the amino acid sequence of any one of Tyr-Gly-Phe-Gly-Gly, Tyr-Gly-Phe-His-Gly, Gly-Phe-Gly-Gly and Met-Tyr-Gly-Phe-Gly-Gly as denoted by SEQ ID NOs:1, 2, 3 and 4 respectively, or of a composition comprising said oligopeptide as an effective ingredient.